In the Claims:

Please amend the claims as follows.

The following lists all claims and their status:

1 – 946 (cancelled)

947. (currently amended): A method of treating a hydrocarbon containing formation in situ, comprising:

heating a portion of the formation to a temperature sufficient to support oxidation of hydrocarbons ~~within~~ in the heated portion, wherein the heated portion is located in the formation substantially adjacent to a wellbore;

providing an oxidant to a conduit positioned in the wellbore;

allowing the ~~flowing an~~ oxidant to flow from the ~~through a~~ conduit ~~positioned within the wellbore~~ to a heat source zone ~~within~~ in the heated portion, wherein the heat source zone supports an oxidation reaction between the oxidant and hydrocarbons ~~and the oxidant~~ in the heat source zone;

allowing at least ~~reacting~~ a portion of the oxidant to react with hydrocarbons in the heat source zone to generate heat; and

allowing~~transferring generated~~ heat to transfer substantially by conduction from the heat source zone to a pyrolysis zone ~~of~~ in the formation to pyrolyze at least a portion of the hydrocarbons ~~within~~ in the pyrolysis zone, wherein the heat source zone and the pyrolysis zone are radially displaced from the longitudinal axis of the wellbore.

948. (currently amended): The method of claim 947, wherein heating the portion of the formation comprises raising a temperature of the heated portion above about 400 °C.

949. (currently amended): The method of claim 947, wherein the conduit comprises critical flow orifices, the method further comprising allowing~~flowing~~ the oxidant to flow through the

critical flow orifices to the heat source zone.

950. (currently amended): The method of claim 947, further comprising removing oxidation reaction products from the heat source zone through the wellbore.

951. (currently amended): The method of claim 947, further comprising removing excess oxidant from the heat source zone to inhibit ~~transport of~~ the oxidant from flowing to the pyrolysis zone.

952. (currently amended): The method of claim 947, further comprising ~~transporting~~ allowing the oxidant to transport ~~from the conduit to~~through the heat source zone substantially by diffusion.

953. (currently amended): The method of claim 947, further comprising heating the conduit with heat from oxidation reaction products being removed through the wellbore.

954. (original): The method of claim 947, wherein the oxidant comprises hydrogen peroxide.

955. (original): The method of claim 947, wherein the oxidant comprises air.

956. (original): The method of claim 947, wherein the oxidant comprises a fluid substantially free of nitrogen.

957. (currently amended): The method of claim 947, further comprising limiting an amount of oxidant provided to the conduit to maintain a temperature of the heat source zone ~~less than~~below about 1200 °C.

958. (currently amended): The method of claim 947, ~~wherein~~ further comprising electrically heating the portion of the formation ~~comprises electrically heating the formation~~to the temperature sufficient to support oxidation of hydrocarbons.

Sub D3

959. (currently amended): The method of claim 947, ~~wherein heating the portion of the formation comprises~~further comprising ~~heating the portion~~ using exhaust gases from a surface burner to heat the heated portion of the formation to the temperature sufficient to support oxidation of hydrocarbons.

960. (currently amended): The method of claim 947, ~~wherein heating the portion of the formation comprises heating the portion with~~further comprising using a flameless distributed combustor to heat the heated portion of the formation to the temperature sufficient to support oxidation of hydrocarbons.

961. (currently amended): The method of claim 947, further comprising controlling a pressure and a temperature ~~within~~ in at least a majority of the pyrolysis zone, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

C5

962. (currently amended): The method of claim 947, further comprising controlling an amount of oxidant provided to the conduit to control ~~the~~ heating of the pyrolysis zone such that an average heating rate of the pyrolysis zone is less than about 1 °C per day during pyrolysis.

963. (currently amended): The method of claim 947, wherein heating of the pyrolysis zone ~~heating the portion comprises heating the pyrolysis zone such that~~increases a thermal conductivity of at least a portion of the pyrolysis zone ~~is~~ to greater than about 0.5 W/(m °C).

964. (currently amended): The method of claim 947, further comprising controlling a pressure ~~within~~ in at least a majority of the pyrolysis zone of the formation, wherein the controlled pressure is at least about 2.0 bars absolute.

965. (currently amended): The method of claim 947, further comprising:

providing hydrogen (H_2) to the pyrolysis zone to hydrogenate hydrocarbons ~~within~~ in the pyrolysis zone; and

heating a portion of the pyrolysis zone with heat from hydrogenation.

966. (currently amended): The method of claim 947, wherein heating of the pyrolysis zone ~~transferring generated heat comprises increasing~~ increases a permeability of a majority of the pyrolysis zone to greater than about 100 millidarcy.

967. (currently amended): The method of claim 947, wherein heating of the pyrolysis zone ~~transferring generated heat comprises substantially uniformly increasing~~ increases a permeability of a majority of the pyrolysis zone such that the permeability of the majority of the pyrolysis zone is substantially uniform.

968. (currently amended): The method of claim 947, wherein ~~the~~ heating of the pyrolysis zone is controlled to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by the Fischer Assay.

969. (currently amended): The method of claim 947, wherein the wellbore is located along strike of the formation to reduce pressure differentials along a heated length of the wellbore.

970. (currently amended): The method of claim 947, wherein the wellbore is located along strike of the formation to increase uniformity of heating along a heated length of the wellbore.

971. (currently amended): The method of claim 947, wherein the wellbore is located along strike of the formation to increase control of heating along a heated length of the wellbore.

972. (currently amended): A method of treating a hydrocarbon containing formation in situ, comprising:

heating a portion of the formation to a temperature sufficient to support ~~reaction~~ oxidation of hydrocarbons ~~within~~ in the portion of the formation ~~with an oxidant~~;

~~flowing~~ providing ~~the~~ an oxidant ~~into~~ to a conduit, ~~and~~ wherein the conduit is ~~connected~~ positioned such that the oxidant ~~can~~ flows from the conduit to ~~the hydrocarbons~~the heated

portion;

allowing the oxidant ~~and the hydrocarbons~~ to ~~react~~ oxidize at least some hydrocarbons in a heat source zone to produce heat in ~~a~~ the heat source zone;

allowing heat to transfer from the heat source zone to a pyrolysis zone in the formation to pyrolyze at least a portion of the hydrocarbons ~~within~~ in the pyrolysis zone, wherein the heat source zone and the pyrolysis zone are portions of a single hydrocarbon layer; and

removing ~~reaction~~ oxidation products from the heat source zone such that the ~~reaction~~ oxidation products are inhibited from flowing from the heat source zone to the pyrolysis zone.

973. (currently amended): The method of claim 972, wherein heating the portion of the formation comprises raising the temperature of the heated portion above about 400 °C.

974. (currently amended): The method of claim 972, ~~wherein~~ further comprising electrically heating the portion of the formation ~~comprises electrically heating the formation~~to the temperature sufficient to support oxidation of hydrocarbons.

975. (currently amended): The method of claim 972, ~~wherein heating the portion of the formation comprises heating the portion~~further comprising using exhaust gases from a surface burner to heat the heated portion to the temperature sufficient to support oxidation of hydrocarbons.

976. (currently amended): The method of claim 972, wherein the conduit comprises critical flow orifices, the method further comprising ~~flowing~~ allowing the oxidant to flow through the critical flow orifices to the ~~heat source zone~~heated portion.

977. (currently amended): The method of claim 972, wherein the conduit is located ~~within~~ in a wellbore, and wherein removing ~~reaction~~ oxidation products comprises removing ~~reaction~~ oxidation products from the heat source zone through the wellbore.

978. (currently amended): The method of claim 972, further comprising removing excess

oxidant from the heat source zone to inhibit ~~transport of~~ the oxidant from flowing to the pyrolysis zone.

979. (currently amended): The method of claim 972, further comprising ~~transporting~~ allowing the oxidant to transport ~~from the conduit to~~ through the heat source zone substantially by diffusion.

980. (currently amended): The method of claim 972, wherein the conduit is located ~~within~~ in a wellbore, the method further comprising heating the conduit with heat from ~~reaction~~ oxidation products being removed through the wellbore to raise a temperature of the oxidant passing through the conduit.

981. (original): The method of claim 972, wherein the oxidant comprises hydrogen peroxide.

982. (original): The method of claim 972, wherein the oxidant comprises air.

983. (original): The method of claim 972, wherein the oxidant comprises a fluid substantially free of nitrogen.

984. (currently amended): The method of claim 972, further comprising limiting an amount of oxidant provided to the conduit to maintain a temperature of the heat source zone ~~less than~~below about 1200 °C.

985. (currently amended): The method of claim 972, further comprising limiting an amount of oxidant provided to the conduit to maintain a temperature of the heat source zone at a temperature that inhibits production of oxides of nitrogen.

986. (currently amended): The method of claim 972, ~~wherein heating a portion of the formation to a temperature sufficient to support oxidation of hydrocarbons within the portion further comprises heating with~~further comprising using a flameless distributed combustor to heat

the heated portion to the temperature sufficient to support oxidation of hydrocarbons.

987. (currently amended): The method of claim 972, further comprising controlling a pressure and a temperature ~~within~~ in at least a majority of the pyrolysis zone of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

988. (currently amended): The method of claim 972, further comprising controlling ~~the~~ an amount of oxidant provided to the conduit to control heating of the pyrolysis zone such that an average heating rate of the pyrolysis zone is less than about 1 °C per day during pyrolysis.

989. (currently amended): The method of claim 972, wherein allowing the heat to transfer from the heat source zone to the pyrolysis zone comprises allowing the heat to transfer ~~ring heat~~ substantially by conduction.

990. (currently amended): The method of claim 972, wherein ~~allowing heat to transfer comprises~~ heating of the pyrolysis zone ~~such that~~ increases a thermal conductivity of at least a portion of the pyrolysis zone ~~is~~ to greater than about 0.5 W/(m °C).

991. (currently amended): The method of claim 972, further comprising controlling a pressure ~~within~~ in at least a majority of the pyrolysis zone, wherein the controlled pressure is at least about 2.0 ~~bar~~ bars absolute.

992. (currently amended): The method of claim 972, further comprising:

providing hydrogen (H_2) to the pyrolysis zone to hydrogenate hydrocarbons ~~within~~ in the pyrolysis zone; and

heating a portion of the pyrolysis zone with heat from hydrogenation.

993. (currently amended): The method of claim 972, wherein ~~allowing the heat to transfer comprises~~ heating of the pyrolysis zone ~~increasing~~ increases a permeability of a majority of the

pyrolysis zone to greater than about 100 millidarcy.

994. (currently amended): The method of claim 972, wherein ~~allowing the heat to transfer comprises substantially uniformly increasing~~heating of the pyrolysis zone increases a permeability of a majority of the pyrolysis zone such that the permeability of the majority of the pyrolysis zone is substantially uniform.

995. (original): The method of claim 972, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by the Fischer Assay.

996. (currently amended): An in situ method for heating a hydrocarbon containing formation, comprising:

heating a portion of the formation to a temperature sufficient to support ~~reaction~~ oxidation of hydrocarbons ~~within~~ in the portion of the formation ~~with an oxidizing fluid~~, wherein the portion is located substantially adjacent to an opening in the formation;

providing ~~the~~ an oxidizing fluid to a heat source zone in the ~~formation~~heated portion;

allowing the oxidizing ~~gas~~ fluid to react with at least a portion of the hydrocarbons ~~at~~ in the heat source zone to generate heat in the heat source zone; and

allowing ~~transferring the generated~~ heat to transfer substantially by conduction from the heat source zone to a pyrolysis zone in the formation, wherein the heat source zone abuts the pyrolysis zone.

997. (currently amended): The method of claim 996, further comprising allowing~~transporting~~ the oxidizing fluid to transport through the heat source zone substantially by diffusion.

998. (original): The method of claim 996, further comprising directing at least a portion of the oxidizing fluid into the opening through orifices of a conduit disposed in the opening.

999. (currently amended): The method of claim 996, further comprising ~~controlling~~ directing a flow of the oxidizing fluid ~~with~~ through critical flow orifices ~~of~~ on a conduit disposed in the opening, wherein the critical flow orifices control the flow of oxidizing fluid such that a rate of oxidation is controlled.

1000. (currently amended): The method of claim 996, ~~wherein a conduit is disposed within the opening, the method~~ further comprising removing an oxidation product from the formation through ~~the~~ a conduit disposed in the opening.

1001. (currently amended): The method of claim 996, ~~wherein a conduit is disposed within the opening, the method~~ further comprising removing an oxidation product from the formation through ~~the~~ a conduit disposed in the opening, and allowing the transfer~~ring~~ of substantial heat ~~from~~ between the oxidation product in the conduit ~~to~~ and the oxidizing fluid ~~in the conduit~~.

1002. (currently amended): The method of claim 996, ~~wherein a conduit is disposed within the opening, the method~~ further comprising removing an oxidation product from the formation through ~~the~~ a conduit disposed in the opening, wherein a flow rate of the oxidizing fluid ~~in the conduit~~ is approximately equal to a flow rate of the oxidation product in the conduit.

1003. (currently amended): The method of claim 996, ~~wherein a conduit is disposed within the opening, the method~~ further comprising removing an oxidation product from the formation through ~~the~~ a conduit disposed in the opening, and controlling a pressure between the oxidizing fluid and the oxidation product in the conduit to reduce contamination of the oxidation product by the oxidizing fluid.

1004. (currently amended): The method of claim 996, ~~wherein a center conduit is disposed within an outer conduit, and wherein the outer conduit is disposed within the opening, the method~~ further comprising providing the oxidizing fluid into the opening through ~~the~~ a center conduit disposed in an outer conduit, and removing an oxidation product through the outer conduit.

1005. (original): The method of claim 996, wherein the heat source zone extends radially from the opening a width of less than approximately 0.15 m.

1006. (currently amended): The method of claim 996, ~~wherein~~ further comprising heating the portion ~~comprises~~ by applying electrical current to an electric heater disposed ~~within~~ in the opening.

1007. (original): The method of claim 996, wherein the pyrolysis zone is substantially adjacent to the heat source zone.

1008. (currently amended): The method of claim 996, further comprising controlling a pressure and a temperature ~~within~~ in at least a majority of the pyrolysis zone of the formation, wherein the pressure is controlled as a function of temperature, or the temperature is controlled as a function of pressure.

1009. (currently amended): The method of claim 996, further comprising controlling ~~the~~ an amount of oxidizing fluid provided to the heat source zone to control heating of the pyrolysis zone such that an average heating rate of the pyrolysis zone is less than about 1 °C per day during pyrolysis.

1010. (currently amended): The method of claim 996, ~~wherein~~ further comprising allowing ~~the~~ heat to transfer ~~comprises transferring heat~~through the pyrolysis zone substantially by conduction.

1011. (currently amended): The method of claim 996, wherein ~~allowing heat to transfer comprises heating the portion~~heating of the pyrolysis zone ~~such that~~increases a thermal conductivity of at least a portion of the pyrolysis zone ~~is~~ to greater than about 0.5 W/(m °C).

1012. (currently amended): The method of claim 996, further comprising controlling a pressure ~~within~~ in at least a majority of the pyrolysis zone, wherein the controlled pressure is at least about 2.0 ~~bar~~ bars absolute.

1013. (currently amended): The method of claim 996, further comprising:

providing hydrogen (H_2) to the pyrolysis zone to hydrogenate hydrocarbons ~~within~~ in the pyrolysis zone; and

heating a portion of the pyrolysis zone with heat from hydrogenation.

1014. (currently amended): The method of claim 996, wherein ~~allowing the heat to transfer comprises increasing~~heating of the pyrolysis zone increases a permeability of a majority of the pyrolysis zone to greater than about 100 millidarcy.

1015. (currently amended): The method of claim 996, wherein heating of the pyrolysis zone increases ~~allowing the heat to transfer comprises substantially uniformly increasing~~ a permeability of a majority of the pyrolysis zone such that the permeability of the majority of the pyrolysis zone is substantially uniform.

1016. (original): The method of claim 996, further comprising controlling the heat to yield greater than about 60 % by weight of condensable hydrocarbons, as measured by the Fischer Assay.

1017-5395 (cancelled)

Response To Office Action Mailed November 25, 2002

A. Pending Claims

Claims 947-1016 are currently pending. Claims 947-953, 957-980, 984-994, 996, 997, 999-1004, 1006, and 1008-1015 have been amended. Claims 948-953, 957-971, 973-980, 984-994, 997, 999-1004, 1006, and 1008-1015 have been amended for correction of typographical errors and/or clarification.

B. Information Disclosure Statements

Applicant has not received a signed, initialed copy of Form PTO-1449 (1 page, references G5-G9) submitted with the Information Disclosure Statement mailed on August 22, 2002 (postcard stamped received by the USPTO on August 28, 2002). Applicant respectfully requests a signed, initialed copy of the above-mentioned Form PTO-1449. A copy the originally filed Form PTO-1449 is enclosed for the Examiner's convenience.

C. Submission of Corrected Formal Drawings

In the Office Action mailed November 25, 2002, the Examiner indicated approval of the proposed drawing corrections filed on February 12, 2002. Applicant submits the corrected formal drawings approved by the Examiner (eight sheets, including FIGS. 32, 56, 57, 67, 68, 72, 73, 76, 81a, and 97).

Applicant respectfully requests that the accompanying amended drawing (one sheet, including FIGS. 23a and 23b) be approved by the Examiner in the above-identified application. In FIG. 23a, centralizer 581 was inadvertently labeled as 581e in two locations. The two labels have been corrected by replacing 581e with 581. In FIG. 23b, centralizer 581 was inadvertently labeled as 581e in one location. The label has been corrected by replacing 581e with 581.

D. Provisional Double Patenting Rejection

The Examiner provisionally rejected claims 947-1016 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over copending U.S. Patent Applications:

09/841,936; 09/841,937; 09/841,000; 09/841,060; 09/841,061; 09/841,127; 09/841,128; 09/841,129; 09/841,130; 09/841,131; 09/841,170; 09/841,193; 09/841,194; 09/841,195; 09/841,238; 09/841,239; 09/841,240; 09/841,283; 09/841,284; 09/841,285; 09/841,286; 09/841,287; 09/841,288; 09/841,289; 09/841,290; 09/841,291; 09/841,292; 09/841,293; 09/841,294; 09/841,295; 09/841,296; 09/841,297; 09/841,298; 09/841,299; 09/841,300; 09/841,301; 09/841,302; 09/841,303; 09/841,304; 09/841,305; 09/841,306; 09/841,307; 09/841,308; 09/841,309; 09/841,310; 09/841,311; 09/841,312; 09/841,429; 09/841,430; 09/841,431; 09/841,432; 09/841,433; 09/841,434; 09/841,435; 09/841,436; 09/841,437; 09/841,438; 09/841,439; 09/841,440; 09/841,441; 09/841,442; 09/841,443; 09/841,444; 09/841,445; 09/841,446; 09/841,448; 09/841,449; 09/841,488; 09/841,489; 09/841,490; 09/841,491; 09/841,492; 09/841,493; 09/841,494; 09/841,495; 09/841,496; 09/841,497; 09/841,498; 09/841,499; 09/841,500; 09/841,501; 09/841,502; 09/841,632; 09/841,633; 09/841,634; 09/841,635; 09/841,636; 09/841,637; 09/841,638; and 09/841,639.

Applicant respectfully traverses the provisional double patenting rejection. Applicant respectfully submits that the omnibus nature of this rejection does not provide Applicant with sufficient detail in which to address such rejection. Applicant also respectfully submits that the rejection is inconsistent with certain restrictions issued in the above-referenced cases. Applicant respectfully requests reconsideration.

Pursuant to discussion with the Examiner, for the convenience of the Examiner's Supervisor, Applicant will forward copies of allowed claims for the above-referenced cases to the Examiner's Supervisor. Applicant understands that the Examiner's Supervisor will review the allowed claims for the above-referenced cases and then reconsider the double patenting rejection in view of such allowed claims.

E. The Claims Are Not Anticipated By Alleman Pursuant To 35 U.S.C. § 102(b)

The Examiner rejected claims 947-950, 952, 953, 955, 956, 966-971, 972, 973, 976, 977, 979, 980, 982, 983, 989, 993-995, 996-1001, 1004, 1007, 1010, and 1014-1016 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 2,786,660 to Alleman (hereinafter "Alleman"). Applicant respectfully disagrees with these rejections.

The standard for "anticipation" is one of fairly strict identity. To anticipate a claim of a patent, a single prior source must contain all the claimed essential elements. *Hybritech, Inc. v. Monoclonal Antibodies, Inc.*, 802 F.2d 1367, 231 U.S.P.Q.81, 91 (Fed. Cir. 1986); *In re Donahue*, 766 F.2d 531,226 U.S.P.Q. 619,621 (Fed. Cir. 1985).

The Examiner states: "Alleman teaches the method of treating a hydrocarbon formation including the steps of heating a portion of the formation to a temperature sufficient to support oxidation; flowing an oxidant; reacting the oxidant with hydrocarbons and transferring heat as called for in claim 947." The Examiner makes similar statements for claims 972 and 996.

Alleman discloses:

> The fluid or fluids being forced into hole 16 through pipe 21 emerge from radial jet holes 26 in the jet nozzle 22 and burn, erode and otherwise enter coal vein 14 along planes 27, causing a rapid burning or gasification of the coal to proceed at a relatively high temperature whereby optimum amounts of gas having a valuable composition are produced and the coal 14 is reduced to ashes and/or coke 28. When the coal 14 is reduced to ashes 28 at a point adjacent jet nozzle 22, the jet nozzle is then moved through hole 16 to a new position where it will operate on fresh coal, and this movement may be either uniform or by steps as desired, as will be explained below. (Alleman, column 3, lines 39-50)

Alleman also discloses:

> All of the time that this burning and various reactions are taking place the reaction gases are traveling through hole 16 around pipe 21 into head 29 and through pipe 23 to a gas holder 37 of the usual type. The pressure of the gas is preferably indicated on gauge 34 and samples of the gas being produced are preferably analyzed in the gas analyzer 44. At the same time the composition

> of gases entering through valve 48, 58 and 69 is preferably known and the pressure thereof is preferably measured by gauge 71. (Alleman, column 6, lines 57-66)

Amended claim 947 describes a combination of features including: "allowing heat to transfer substantially by conduction from the heat source zone to a pyrolysis zone in the formation to pyrolyze at least a portion of the hydrocarbons in the pyrolysis zone, wherein the heat source zone and the pyrolysis zone are radially displaced from the longitudinal axis of the wellbore." Amended claim 972 describes a combination of features including: "allowing heat to transfer from the heat source zone to a pyrolysis zone in the formation to pyrolyze at least a portion of the hydrocarbons in the pyrolysis zone, wherein the heat source zone and the pyrolysis zone are portions of a single hydrocarbon layer." Amended claim 996 describes a combination of features including: "allowing heat to transfer substantially by conduction from the heat source zone to a pyrolysis zone in the formation, wherein the heat source zone abuts the pyrolysis zone." Support for the amendments to claims 947, 972, and 996 is found in Applicant's Specification at least in FIG. 10 and on page 80, lines 8 to 19.

Alleman appears to teach or suggest the rapid burning or gasification of coal to reduce the coal to ashes and/or coke. Alleman does not appear to teach or suggest at least the features of "allowing heat to transfer substantially by conduction from the heat source zone to a pyrolysis zone in the formation to pyrolyze at least a portion of the hydrocarbons in the pyrolysis zone". Applicant requests removal of the rejections of claim 947, 972, and 976 and the claims dependent thereon.

Applicant submits that many of the claims dependent on claims 947, 972, and 996 are separately patentable.

The Examiner states: "Alleman also teaches the critical flow orifices (83, 84) as called for in claim 949." The Examiner also states: "Alleman also teaches the critical flow orifices (83,84) as called for in claim 976." The Examiner also states: "Alleman also teaches the critical flow orifices (83,84) as called for in claim 999."

Alleman teaches: "The fluid or fluids being forced into hole 16 through pipe 21 emerge from radial jet holes 26 in the jet nozzle 22 and burn, erode and otherwise enter coal vein 14 along planes 27, causing a rapid burning or gasification of the coal to proceed at a relatively high temperature..." (Alleman, col. 3, lines 39-43)

Amended claim 949 describes a combination of features including: "wherein the conduit comprises critical flow orifices, the method further comprising allowing the oxidant to flow through the critical flow orifices to the heat source zone." Amended claim 976 describes a combination of features including: "wherein the conduit comprises critical flow orifices, the method further comprising allowing the oxidant to flow through the critical flow orifices to the heated portion." Amended claim 999 describes a combination of features including: "further comprising directing a flow of the oxidizing fluid through critical flow orifices on a conduit disposed in the opening, wherein the critical flow orifices control the flow of oxidizing fluid such that a rate of oxidation is controlled." Applicant submits that the "radial jet holes" as disclosed by Alleman do not appear to teach or suggest "critical flow orifices" as claimed in claims 949, 976, and 999. Applicant respectfully requests the removal of the rejections of claims 949, 976, and 999.

The Examiner states: "With regards to claims 966 and 967; the increase in permeability is inherent." The Examiner makes similar statements about claims 993, 994, 1014, and 1015. The fact that a certain result or characteristic may occur or be present in the prior art,however, is not sufficient to establish the inherency of that result or characteristic. *In re Rijckaert*, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993). "To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is necessarily present in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient.'" *In re Robertson*, 169 F.3d 743, 745, 49 USPQ2d 1949, 1950-51 (Fed. Cir. 1999).

Alleman discloses: "The fluid or fluids being forced into hole 16 through pipe 21 emerge from radial jet holes 26 in the jet nozzle 22 and burn, erode and otherwise enter coal vein 14 along planes 27, causing a rapid burning or gasification of the coal to proceed at a relatively high temperature whereby optimum amounts of gas having a valuable composition are produced and the coal 14 is reduced to ashes and/or coke 28." (Alleman, col. 3, lines 39-46)

Amended claims 966, 993, and 1014 describe a combination of features including: "wherein heating of the pyrolysis zone increases a permeability of a majority of the pyrolysis zone to greater than about 100 millidarcy." Amended claims 967, 994, and 1015 describe a combination of features including: "wherein heating of the pyrolysis zone increases a permeability of a majority of the pyrolysis zone such that the permeability of the majority of the pyrolysis zone is substantially uniform." Applicant submits that "rapid burning or gasification of the coal" to reduce the coal "to ashes and/or coke" does not inherently suggest a substantially uniform permeability in a pyrolysis zone as claimed in claims 967, 994, and 1015 or that the permeability is increased to greater than 100 millidarcy in a pyrolysis zone. The above-quoted features, in combination with other features of the claims, do not appear to be taught or suggested by the cited art. Applicant respectfully requests the removal of the rejections of claims 966, 967, 993, 994, 1014, and 1015.

F. The Claims Are Not Anticipated by Terry '025 Pursuant To 35 U.S.C. § 102(b)

The Examiner rejected claims 947, 948, 950, 952, 953, 955, 956, 965, 966, 967, 968, 972, 973, 977, 979, 980, 982, 983, 989, 992, 993, 994, 995, 996, 997, 1000, 1001, 1007, 1010, 1013, 1014, 1015, and 1016 under 35 U.S.C. 102(b) as being anticipated by U.S. Patent No. 4,093,025 to Terry (hereinafter "Terry '025"). Applicant respectfully disagrees with these rejections.

The Examiner states: "Terry teaches the method of treating a hydrocarbon formation including the steps of heating a portion of the formation to a temperature sufficient to support oxidation; flowing an oxidant; reacting the oxidant with hydrocarbons and transferring heat as called for in claim 947." The Examiner makes similar statements about claims 972 and 996.

Terry '025 states:

> Referring first to FIG. 3, coal strata No. 1, 2, and 3 are shown separated by layers of shale. Each coal stratum can be divided into one or more blocks of coal which can be subjected to one or more production phases as described herein. (Terry '025, column 7, lines 38-42)

Terry '025 also states:

> In the preferred method, in Phase 4, carried out in coal blocks 4 and 6, the gases are subjected to pyrolysis as described in my copending application Ser. No. 750,714 with the objectives of driving off volatile matter as gases and oozing tars. This phase is begun after coal blocks 7 and 9 have been under gasification for a period of time, for example, three months. The gasification projects in blocks 7 and 9 have generated a substantial amount of heat underground, a portion of which has been transferred through the overlying layer of shale 16 into the coal in blocks 4 and 6. (Terry '025, column 9, lines 39-49)

Amended claim 947 describes a combination of features including: "allowing heat to transfer substantially by conduction from the heat source zone to a pyrolysis zone in the formation to pyrolyze at least a portion of the hydrocarbons in the pyrolysis zone, wherein the heat source zone and the pyrolysis zone are radially displaced from the longitudinal axis of the wellbore."

Terry '025 appears to teach or suggest generating heat, transferring the heat vertically through a shale layer, and pyrolyzing a separated overlying coal layer. Terry '025 does not appear to teach or suggest allowing heat to transfer substantially by conduction from the heat source zone to a pyrolysis zone in the formation to pyrolyze at least a portion of the hydrocarbons in the pyrolysis zone, wherein the heat source zone and the pyrolysis zone are radially displaced from the longitudinal axis of the wellbore. Applicant respectfully requests removal of the rejections of claim 947 and the claims dependent thereon.

Amended claim 972 describes a combination of features including: "allowing heat to transfer from the heat source zone to a pyrolysis zone in the formation to pyrolyze at least a portion of the hydrocarbons in the pyrolysis zone, wherein the heat source zone and the pyrolysis zone are portions of a single hydrocarbon layer." Terry '025 appears to teach or suggest that the heat source zone and the pyrolysis zone are separated vertically by a shale layer. Terry '025 does not appear to teach or suggest allowing heat to transfer from the heat source zone to a pyrolysis zone in the formation to pyrolyze at least a portion of the hydrocarbons in the pyrolysis zone, wherein the heat source zone and the pyrolysis zone are portions of a single hydrocarbon layer. Applicant respectfully requests removal of the rejections of claim 972 and the claims dependent thereon.

Amended claim 996 describes a combination of features including: "allowing heat to transfer substantially by conduction from the heat source zone to a pyrolysis zone in the formation, wherein the heat source zone abuts the pyrolysis zone." Terry '025 appears to teach or suggest that the heat source zone and the pyrolysis zone are separated vertically by a shale layer. Terry '025 does not appear to teach or suggest allowing heat to transfer substantially by conduction from the heat source zone to a pyrolysis zone in the formation, wherein the heat source zone abuts the pyrolysis zone. Applicant respectfully requests removal of the rejections of claim 996 and the claims dependent thereon.

The Examiner states: "With regards to claim 1007; the pyrolysis zone adjacent to the heat zone is inherent." Terry '025 does not appear to teach or suggest the presence of a pyrolysis zone adjacent to a heat zone. Terry '025 appears to teach or suggest that the heat zone and pyrolysis zone are separated by a layer of shale. Applicant respectfully requests removal of the rejection of claim 1007.

G. The Claims Are Not Obvious Over Alleman Pursuant To 35 U.S.C. § 103(a)

The Examiner rejected claims 953, 990, 1002, 1003, and 1011 as obvious over Alleman pursuant to 35 U.S.C. § 103(a). Applicant respectfully disagrees with these rejections.

In order to reject a claim as obvious, the Examiner has the burden of establishing a *prima facie* case of obviousness. *In re Warner et al.*, 379 F.2d 1011, 154 U.S.P.Q. 173, 177-178 (C.C.P.A. 1967). To establish a *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 U.S.P.Q. 580 (C.C.P.A. 1974), MPEP § 2143.03.

The Examiner states: "Alleman fails to teach the conductivity greater than 0.5W/m°C. It is well known that most coals have thermal conductivities greater than 0.5W/m°C; thus it would have been obvious to one of ordinary skill in the art at the time of the invention to have practiced the method of Alleman in a coal seam with a thermal conductivity greater than 0.5W/m°C as called for in claims 953, 990, and 1011."

Amended claims 963, 990, and 1011 describe a combination of features including: "wherein heating of the pyrolysis zone increases a thermal conductivity of at least a portion of the pyrolysis zone to greater than about 0.5 W/(m °C)."

Applicant submits that heating of the pyrolysis zone to increase a thermal conductivity of a portion of the pyrolysis zone to greater than about 0.5 W/(m °C) is unexpected based on literature in the art. For example, Applicant's Specification states:

> Certain embodiments described herein will in many instances be able to economically treat formations that were previously believed to be uneconomical. Such treatment will be possible because of the surprising increases in thermal conductivity and thermal diffusivity that can be achieved with such embodiments. These surprising results are illustrated by the fact that prior literature indicated that certain hydrocarbon containing formations, such as coal, exhibited relatively low values for thermal conductivity and thermal diffusivity when heated. For example, in government report No. 8364 by J. M. Singer and R. P. Tye entitled "Thermal, Mechanical, and Physical Properties of Selected Bituminous Coals and Cokes," U.S. Department of the Interior, Bureau of Mines (1979), the authors report the thermal conductivity and thermal diffusivity for four bituminous coals. This government report includes graphs of thermal conductivity and diffusivity that show relatively

low values up to about 400 °C (e.g., thermal conductivity is about 0.2 W/(m °C) or below, and thermal diffusivity is below about 1.7 x 10^{-3} cm^2/s). This government report states that "coals and cokes are excellent thermal insulators."

In contrast, in certain embodiments described herein hydrocarbon containing resources (e.g., coal) may be treated such that the thermal conductivity and thermal diffusivity are significantly higher (e.g., thermal conductivity at or above about 0.5 W/(m °C) and thermal diffusivity at or above 4.1 x 10^{-3} cm^2/s) than would be expected based on previous literature such as government report No. 8364. If treated as described in certain embodiments herein, coal does not act as "an excellent thermal insulator." Instead, heat can and does transfer and/or diffuse into the formation at significantly higher (and better) rates than would be expected according to the literature, thereby significantly enhancing economic viability of treating the formation. (Specification, page 150, line 18 to page 151, line 10)

Thus, Applicant submits that heating the pyrolysis zone such that a thermal conductivity of a portion of the pyrolysis zone is greater than about 0.5 W/(m °C) is not an obvious matter of choice or design. Applicant respectfully requests removal of the rejections of claims 963, 990, and 1011.

H. The Claims Are Not Obvious Over Alleman In View of Bain et al. Pursuant To 35 U.S.C. 103(a)

The Examiner rejected claims 954 and 981 under 35 U.S.C. 103(a) as obvious over Alleman in view of U.S. Patent No. 5,008,085 to Bain et al. (hereinafter "Bain"). Applicant respectfully disagrees with these rejections.

The Examiner states:

> Alleman fails to teach the hydrogen peroxide. Bain teaches that hydrogen peroxide is useful in a similar process, based on the nature of the reactants (col. 8, lines 16-25). It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the Alleman method to have used hydrogen peroxide in place of air or oxygen, as called for in claims 954 and 981, based on the nature of the hydrocarbons and the desired end products.

Bain states: "This process is especially useful for treating heavy oil crudes of a nature and viscosity which renders them unsuitable for direct pipeline transport. This includes feeds having a viscosity above about 1000 centipoise (cp) at 25° C." (Bain, column 6, lines 63-67) Bain also states: "Hydrocarbon feeds which can be used in the present apparatus include, but are not limited to, heavy whole crude oil, tarsands, bitumen, kerogen, and shale oils." (Bain, column 7, lines 12-14) Alleman states: "Having inserted pipe 21 with a flame burning at the end through hole 26 into the coal seam preferably to the entire extent of hole 16, it is then preferred to admit air or oxygen from line 68 under increased pressure causing localized burning of the coal in seam 16 adjacent jets 26." (Alleman, column 6, lines 17-22)

Claims 954 and 981 recite in part: "wherein the oxidant comprises hydrogen peroxide." Bain appears to teach or suggest the use of hydrogen peroxide to lower the viscosity of a highly viscous crude oil. Alleman appears to teach or suggest using air or oxygen to burn coal. Applicant submits that utilizing hydrogen peroxide in the method of Alleman would not have been obvious due to the unrelated nature of the applications. At least the above-quoted feature of claims 954 and 981, in combination with the features of independent claims 947 and 972, do not appear to be taught or suggested by the cited art. Applicant respectfully requests the removal of the rejections of claims 954 and 981.

I. The Claims Are Not Obvious Over Terry '025 Pursuant To 35 U.S.C. 103(a)

The Examiner rejected claims 958, 959, 960, 964, 974, 975, 986, 991, 1006, and 1012 under 35 U.S.C. 103(a) as obvious over Terry '025. Applicant respectfully disagrees with these rejections.

The Examiner states:

> Terry fails to explicitly disclose the pressure, but teaches that the pressure should balance the hydrostatic head. It is well known that the hydrostatic head

> is greater than 2 bar in many coal seams. It would have been obvious to one of ordinary skill in the art at the time of the invention to have modified the Terry method to have the pressure greater than about 2.0 bar, as called for in claims 964, 991, and 1012, based on existing hydrostatic head.

Terry states: "In the preferred method, in Phase 4, carried out in coal blocks 4 and 6, the gases are subjected to pyrolysis as described in my copending application Ser. No. 750,714 with the objectives of driving off volatile matter as gases and oozing tars." (Terry '025, column 9, lines 39-43)

Amended claims 964, 991, and 1012 describe a combination of features including: "controlling a pressure in at least a majority of the pyrolysis zone of the formation, wherein the controlled pressure is at least about 2.0 bars absolute."

Applicant's Specification states:

> The pressure may be varied to control a composition of the produced fluid, to control a percentage of condensable fluid as compared to non-condensable fluid, or to control an API gravity of fluid being produced. Increasing pressure may increase the API gravity of the produced fluid. Increasing pressure may also increase a percentage of paraffins within the produced fluid. (Specification, page 190, lines 7-11)

Applicant teaches and claims controlling pressure. Terry '025 appears to teach or suggest removing volatile gases and oozing tars from the pyrolysis zone. Terry '025 does not appear to teach or suggest controlling pressure. Applicant respectfully requests removal of the rejections of claims 964, 991, and 1012.

J. Summary

Applicant submits that all claims are in condition for allowance. Favorable reconsideration is respectfully requested.

A fee authorization is enclosed to cover a one-month extension of time. If any fees are omitted, if any additional fees are required, or if any fees have been overpaid, please appropriately charge or credit those fees to Meyertons, Hood, Kivlin, Kowert & Goetzel, P.C. Deposit Account Number 50-1505/5659-01000/EBM.

Respectfully submitted,

Eric B. Meyertons
Reg. No. 34,876

Attorney for Applicant

MEYERTONS, HOOD, KIVLIN, KOWERT & GOETZEL P.C.
P.O. Box 398
Austin, TX 78767-0398
(512) 853-8800 (voice)
(512) 853-8801 (facsimile)

Date: 3-25-03

Respectfully submitted,

Eric B. Meyertons
Reg. No. 34,876

Attorney for Applicant

MEYERTONS, HOOD, KIVLIN, KOWERT, & GOETZEL P.C.
P.O. Box 398
Austin, TX 78767-0398
(512) 853-8800 (voice)
(512) 853-8801 (facsimile)

Date: 3-25-03